president until the conference in 1923. Prof. E. van Everdingen was elected vice president, and Dr. Hesselberg, Director of the Meteorological Institute, Christiania, secretary.

It was agreed, on the invitation of Prof. E. van Everdingen, that a conference of directors of meteorological institutes and observatories should be held in Utrecht in 1923, either in the spring or autumn, as may be found the more convenient.

AMERICAN MEMBERS OF INTERNATIONAL COMMISSIONS.

The following names are those of American meteorologists who are members of the various commissions of the International Meteorological Committee:

Prof. C. F. Marvin, Chief of the U. S. Weather Bureau, Washington: International Commission for Meteorological Telegraphy; International Commission for Marine Meteorology; Commission du Réseau Mondial et de la Météorologie Polaire; International Commission for the Investigation of the Upper Air.

Dr. H. H. Kimball, Weather Bureau, Washington: International Commission for Solar Radiation.

Prof. J. Warren Smith, Weather Bureau, Washington: International Commission for Agricultural Meteorology.

Maj. W. R. Blair, Signal Corps, Washington: International Commission for the Application of Meteorology to Aerial Navigation.

Dr. C. G. Abbot, Smithsonian Institution, Washington: International Commission for Solar Radiation.

Dr. L. A. Bauer, Carnegie Institution, Washington: International Commission for Terrestrial Magnetism and Atmospheric Electricity.

551.465.55 (79)

RELATION OF COASTAL CURRENTS AND WINDS ON THE PACIFIC COAST.[1]

By H. A. MARMER.

[Abstract reprinted from *Jour. Washington Acad. of Sciences*, Oct. 4, 1921, pp. 397–398.]

This paper presented the results of an investigation of the speeds and directions of the current along the Pacific coast of the United States brought about by local winds. The investigation was undertaken primarily for the purpose of aiding the mariner and was based on observations made under the direction of the Coast and Geodetic Survey by members of the crews of the five light vessels stationed along the coast from San Francisco Bay to the Strait of Juan de Fuca. The apparatus used for measuring the speed and direction of the current was necessarily the simplest, and consisted of a 15-foot current pole, a log line graduated to knots and tenths for a run of one minute, a stop watch, and a pelorus. The wind velocity was estimated in accordance with the Beaufort scale.

Since the current as observed is the resultant of a number of different currents due to various causes, such as tides, winds, river discharge, and differences in density, the observations are tabulated with reference to various arguments. Thus by tabulating with reference to time of tide at a near-by port for periods of 29 days, the tidal current is derived. This current on the Pacific coast, offshore, is of the rotary type, the direction of rotation being clockwise, and shows considerable diurnal inequality. The wind current is derived by tabulating the observations with reference to winds of particular velocity and direction; then by summing for each such wind a large number of observations, the tidal current may be considered as very nearly eliminated.

In the present investigation the observations were tabulated with reference to winds from a given direction divided in groups covering a range of wind velocity of 10 miles. The results derived show that on the Pacific coast, at a distance of from 4 to 10 miles from the land, winds from 10 to 70 miles per hour will give rise to currents from one-fourth of a knot to over a knot; and this current will set, not in a direction of the wind, but in a direction of about 20° to the right of the wind. This has an important bearing on navigation, since winds blowing parallel to the coast or even away from the coast may give rise to currents tending to set a vessel on shore.

In the results presented for each of the light vessels the effect of fresh-water run-off at the light vessels stationed off San Francisco, Columbia River and Swiftsure Bank was sufficiently large in some cases to change the direction of the current brought about by winds of moderate velocity from the characteristic deviation of 20° to the right of the wind direction. But with increasing wind velocity the direction of the current approximated toward the direction of 20° to the right of the wind.

[1] Presented before Philosophical Society of Washington, May 21, 1921.

RESISTANCE OF AIR TO THE MOVEMENT OF SPHERES AND THE ASCENSIONAL RATE OF PILOT BALLOONS.

By C. E. BRAZIER.

[Abstracted from *Comptes Rendus* Oct. 17, 1921, pp. 644–646.]

Formulæ for the computation of the ascensional rate of pilot balloons are of the general form $V=m[A/(A+B)^{2/3}]^n$ in which A and B are the ascensional force and weight of the balloon respectively. But ascensional rates computed from formulæ based upon various determinations of m and n differ widely from one another. In order to determine some criterion for the correct values of these constants, the author has compared data obtained from ascents made by Rouch, Porte, Cave, and Dines, with certain aerodynamical studies made by Eiffel and Maurain upon spheres in moving air as observed in the wind tunnel.

In the equation $R=\frac{K\rho\pi D^2V^2}{4\rho(15°\mathrm{C.},760\mathrm{mm.})}$, in which R is the resistance of the sphere, K the coefficient of resistance, ρ the specific weight of the air, D the diameter of the sphere, and V the speed of the air current, the value of K varies according to the Reynold's number which is defined as $N=VD\rho/\eta$ (η being the viscosity of the air). Between the limits $N=100\times10^3$ and 300×10^3, K is in a large measure a function of the turbulence in the current of air.

It was desirable to compute the values of N and K from two and three theodolite balloon ascents and see if the laboratory relations between the two terms hold in the free air as well as in the wind tunnel. This study involved five assumptions: (1) That the balloon was spherical; (2) that the specific weight of hydrogen is 0.1 kg. per liter; (3) that one may neglect (*a*) the influence of water vapor on the specific weight of air, (*b*) the volume of the balloon envelope, (*c*) the pressure due to the tension of the balloon, (*d*) the difference in temperature between the gas in the balloon and the ambient air, and (*e*) the loss of ascensional force due to diffusion through the rubber; (4) that the mean ascensional speed is reached at 5,000 meters elevation; and (5) that, at this level, the temperature and pressure are equal to their mean annual values, namely 260°A., and 406 mm.

It was found that the values of K do vary with N substantially as found in the laboratory. This permits of quantitative and qualitative work on the question in the wind tunnel and laboratory.—*C. L. M.*

551.508.5 (048)

ON THE COMPARABILITY OF ANEMOMETERS.

By C. E. BRAZIER.

[Abstracted and excerpted from *Comptes Rendus*, Paris Acad., Apr. 4, 1921, p. 843.]

Considerable differences in measured wind speed are observed if two anemometers of different types are exposed in a natural wind, and observations made repeatedly. The clue to the discrepancy lies in number of turns made by the two instruments in the same lapse of time. Inclined currents of air were used, and a comparison of the recorded horizontal component with the actual horizontal component was made. Comparing many types of anemometers in this manner, the following conclusions were drawn:[1]

1. The various types of anemometers, when perfectly calibrated in the laboratory, do not furnish indications comparable among themselves, when exposed in the complex movement of the natural wind, unless the inclination of the wind to the anemometer axis is less than 10°.

2. In an installation where there are frequent eddies due to pronounced vertical components of air movement:

(*a*) The indications of anemometers of the Richard type are too low, while those from the other instruments are too high.

(*b*) The excess of the values obtained with the Robinson anemometers is all the more accentuated when the difference between the diameters of the cups and the distance from center to center of opposite cups is least.

(*c*) The instruments whose indications approach most nearly the true velocities are the Richard type of anemometers and the Robinson with short arms (ratio of diameter of cups to that of cup-center distance 5 to 8).

(*d*) Until the inclinations are of the order of ±50°, measurements of the horizontal component by anemometers B and H agree to within nearly 5 per cent, as shown by the averages of the figures furnished.

(*e*) If the installation permits of the use of only a single instrument it is of advantage to employ a Richard anemometer or in its absence a Robinson anemometer of type H.

(*f*) Conclusions based upon comparisons in the natural wind, of anemometers, one of which has been tested in the laboratory, can be depended upon only when the conditions are the same as those under which the comparisons are made.

551.509 (048)

ON LONG-RANGE FORECASTING.[2]

By JEAN MASCART.

[Abstracted from *Comptes Rendus*, Aug. 22, 1921, pp. 419–420.]

Scientific attempts at long-range forecasting have been somewhat discredited by the necessary exposing of the unscientific methods of the almanac makers. But certain worth-while results have been achieved upon the basis of the assumption that similar weather will be followed by similar weather.

Upon such considerations, the author has made forecasts based upon weather of past years similar to the current weather (the details of the study are not presented), and has issued on the 20th of the month a forecast of the characteristics of the following month. In ordinary day-to-day forecasting his percentage of accuracy is 78.3, and in long-range forecasting, covering a period 10 to 41 days in advance, his percentage is 65.7.

That this is not due to chance is indicated by the fact that some months appear to be consistently better for this type of forecasting. The percentage is 76 in September, as opposed to 59.7 in March. The results are regarded as sufficiently good to warrant further systematic study. —*C. L. M.*

DISCUSSION.

It is to be hoped that M. Mascart, at some future time, will present the details of his method, which we infer to be one based upon ideas prevalent some 20 years ago, to the effect that like follows like in weather sequences.

This thought was frequently discussed by the forecasters of the Weather Bureau at the time and a number of suggestions looking to its practical application in the day-to-day forecasts were put forth.[3]

As may be readily inferred, the plan was to classify the daily weather maps in easily recognizable types and to refer each daily weather map as it was completed to its prototype. The attempt to classify the maps brought out the fact, already suspected, that many maps would defy classification and that still others, while they might resemble the general type in the larger features, yet on closer examination would be found to differ in some essential feature which would place it outside of the original classification.

On the whole the plan was not successful, although it possessed some decided advantages for purely local forecasting.

From the attempt to forecast day-to-day changes it is not a very long step to monthly and seasonal forecasting, and that, in part at least, is what M. Mascart has done.

The present writer has given some attention in a preliminary way to the sequence of weather from month to month. His experience in the study for the continental interior and the northeastern part of the United States leads to the belief that forecasts of a single element, say temperature or precipitation, for a month in advance would not be accurate in 50 per cent of the cases. Some modification of this statement could be made depending upon the closeness of approach to actual conditions that might be attempted. The value of any forecast is directly proportional to its accuracy and definiteness. It is of little moment to forecast that a coming month or season will be warmer or colder than the average. The forecast to be useful should specify how much or how little the departure will be, and in the case of a month whether the departure from the average will occur in the beginning, the middle, or the end of the month.—*A. J. Henry.*

[1] Excerpted from a translation by R. N. Covert.

[2] *Sur la prévision du temps à long terme.*

[3] See Brandenburg, F. H.; Brown, W. C.; Garriott, E. B. MO. WEATHER REV. 29 545–8. Also Richardson, H. W. *ibid* 31:68.